

Implementing and Sustaining a Culture of Sustainability

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USAWC STRATEGY RESEARCH PROJECT

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ABSTRACT

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The quest for global resources be they natural, economic or political, is likely to produce pressures leading to conflicts that will inevitably impact our national interests. The Army's capability to fulfill its responsibilities in protecting those interests is incumbent upon its ability to optimize current and future resources in the most sustainable manner. Sustainability, the use of current resources so as not to deny them for future generations requires dedication, education, innovation and most of all - leadership. This paper will examine Army sustainability and culture implementation, focusing upon energy strategy, and emerging innovative efforts to instill sustainable practices in daily processes and provide recommendations regarding future efforts.

IMPLEMENTING AND SUSTAINING A CULTURE OF SUSTAINABILITY

In a time of fiscal uncertainty it has never been more important to safeguard resources. What has the Army done to change the way it does business on a daily basis? Has the Army successfully created a culture change to the lowest level, from consumers to conservers? Is the Army taking full advantage of emerging technologies in its acquisition strategies? Are sustainability strategies integrated with current and future warfighting capabilities? This paper will focus upon energy sustainability options, strategy, culture and consider these questions to assess what the Army has done to create a culture of sustainability, how it is integrating the culture into daily operations and where we need to go next.

What is Sustainability?

Everywhere we turn, the term *sustainable or sustainability* may be found in relation to energy, food, manufacturing, human resource practices and a host of other terms. What is it and where did it originate? What does it mean to the Army?

The current concept of sustainability, more specifically...sustainable development made its debut in 1987, when the World Commission on Environment and Development (known as the Bruntland Commission) published a report to the United Nations that “presented a new concept – sustainable development...defined as development which meets the needs of current generations without compromising the ability of future generations to meet their own needs.”¹ Prior to then, the concept of environmental stewardship was likely the closest thing to what we think of as sustainability. The first Earth Day was held 22 April, 1970, the result of Wisconsin Senator Gaylord Nelson’s initiative to raise national consciousness of environmental

problems. The Earth Day Network attributes increased awareness to environmental and public health concerns as early as the 1962 publishing of Rachel Carson's New York Times bestseller *Silent Spring*.² Through this reverse chronology, we can see the basis for environmental and energy conservation awareness were sown some fifty years ago. This awareness sparked numerous national, international, public, private and academic councils and studies that continue to explore methods to meet today's needs without jeopardizing the needs of those who will follow. The most common inference finds sustainability has become synonymous with "green concepts" in business and development. As such, there are many definitions representing a variety of perspectives, each with common threads:³

- Sustainability -- "...using a resource so that it is not depleted or permanently damaged". *Webster's Dictionary*
- "Sustainable development is the process of working towards the long term health and vitality of our city and its citizens with regard to ecological, social, cultural, and economic processes." *Sustainable Calgary*
- A sustainable city is a "...place where present day decisions about resource use and land development do not impinge on the quality of air, water, land and the economic livelihood of future generations." *Minneapolis Plan*
- "Sustainable development - decisions and choices made today, should not limit the choices and opportunities of future generations." *Burlington Vermont Comprehensive Plan*
- "Sustainability refers to the ability of a society, ecosystem, or any such ongoing system to continue functioning into the indefinite future without being

forced into decline through exhaustion...of key resources." *Robert Gilman, President of Context Institute*

- Sustainability is "An economic state where the demands placed upon the environment by people and commerce can be met without reducing the capacity of the environment for future generations." *Paul Hawken, author and businessman*
- "Sustainability is the goal of a system of development that recognizes environmental limits and seeks to provide natural resources to support current and future generations in a way that does not damage the environment." *Casper Wyoming Case Study, Environments for Life, 1995*
- "A sustainable community is one that seeks improved public health and a better quality of life for all its residents by limiting waste, prevent pollution, maximizing conservation and promoting efficiency, and developing local resources to revitalize the local economy." *Concern Inc.*
- "Essentially, sustainability is the effective use of resources - natural, human, and technological - to meet today's community needs while ensuring that these resources are available to meet future needs." *Don Geis and Tammy Kutzmark in Developing Sustainable Communities: The Future Is Now*

Sustainability and National Security

Throughout The National Security Strategy of 2010 there is guidance regarding the security concerns given to oil dependency, alternative energy sources, engagement with our closest allies and the need for rebuilding infrastructure.⁴ The primary focus of sustainability as it applies to the armed forces is on energy. In a May 2009 report⁵ entitled *Powering America's Defense: Energy and the Risks to National Security*, the

CNA⁶ Military Advisory Board (MAB)⁷ listed numerous linkages between energy, fossil fuel dependence and national security, below are just a few:

- U.S. dependence on oil weakens international leverage, undermines foreign policy objectives, and entangles America with unstable or hostile regimes.
- U.S. dependence on fossil fuels undermines economic stability, which is critical to national security.
- A fragile domestic electricity grid makes our domestic military installations, and their critical infrastructure, unnecessarily vulnerable to incident, whether deliberate or accidental.

Confronting this challenge is paramount for the military. But, to achieve the desired endstate, America must have a national approach. Securing the country's energy future will require the active leadership and consistent participation of governments at all levels, as well as that of all Americans. The MAB goes further in examining these linkages and posed the following findings deserving serious consideration to rectify our vulnerabilities:

1. The nation's current energy posture is a serious and urgent threat to national security.
 - a. Dependence on oil undermines America's national security on multiple fronts.
 - b. The U.S.'s outdated, fragile, and overtaxed national electrical grid is a dangerously weak link in the national security infrastructure.
2. A business as usual approach to energy security poses an unacceptably high threat level from a series of converging risks.

3. Achieving energy security in a carbon-constrained world is possible, but will require concerted leadership and continuous focus.
4. The national security planning processes have not been sufficiently responsive to the security impacts of America's current energy posture.
5. In the course of addressing its most serious energy challenges, the Department of Defense can contribute to national solutions as a technological innovator, early adopter, and test bed.⁸

Clearly, a strategic approach on a national level is needed and DOD has recognized it has a major role in leading the way. Considering the missions of the Army across the full spectrum of operations, fielding Soldiers and warfighting units in training, in combat or at home in our garrisons it is not difficult to find some element in alignment with each of those definitions. Hence the importance of instilling a truly inclusive culture of sustainability that encompasses energy, technology, human capital management and education. This paper primarily focuses upon the aspects of energy and the culture required to improve the Army's ability to successfully accomplish its core missions.

Strategic Leadership and Culture

Why link Strategic Leadership and Culture Change with Sustainability?

Organizational behavior modification is leader business, and given the scope of sustainability and the global implications, the application of accepted organizational strategic leadership, learning and change methods is imperative to ensure maximum participation and benefit.

What are some of the cultural issues facing strategic leaders regarding the sustainable environment we must establish? If we look to history, the prosperous period following WWII embedded a culture of consumerism and disposable manufacturing

resources were plentiful, technology was prevalent and rather than repairing, renovating and reusing non-functioning items, it was simply easier to obtain new ones. In business, similar mental anchors may be found regarding how to resolve organizational practices that go against sustainable methods. Bob Doppelt, a noted sustainability author, describes these businesses as, “blinded by long-held mental models, [they] fail to fundamentally alter the ways in which their organizations produce goods and services. They believe that sustainability simply involves better controls, marginal improvements, or other “efficiencies” within their existing, linear business model.”⁹ In other words, they treat the symptom as opposed to the cause, thereby ignoring the second and third order effects. Identifying the sources of shortfalls and targeting them for change is imperative.

To identify and work through cultural issues or changeable behaviors, there must be some benchmark definition from which to build. As with sustainability, *culture* is yet another omnipresent and widely defined term (a Google search provides 139 **million** results). The University of Minnesota’s Center for Advanced Research on Language Acquisition (CARLA) fits the intent of this paper: “...**culture** is defined as the shared patterns of behaviors and interactions, cognitive constructs, and affective understanding that are learned through a process of socialization. These shared patterns identify the members of a culture group while also distinguishing those of another group.”¹⁰

The current operating environment presents leaders with a host of challenges to consider when embarking upon the journey to establish and maintain a strategic initiative, not simply in the context of sustainability, but any azimuth change that requires a large paradigm shift. Below are some examples compiled from U.S. Army War College classroom discussions and from an article by Dr. Richard D. White, former

Coast Guard Officer and Professor of Public Administration at Louisiana State University¹¹ of what may result from not identifying and correcting underlying culture issues?

- Inability to make crucial decisions in a timely manner due to ignorance of national, agency/service, or social customs and tendencies of the key players that causes delays or complete breakdown of team cohesiveness.
- Poor decision making due to group thinking, lack of participation, or lack of innovation. Inability or lack of an open climate to initiate ideas or provide dissenting views will drive minority (this term is inclusive - not limited only to race) members to avoid conflict by going with the flow.
- Loss of credibility or reputation and negative media coverage due to poor decisions, lack of discipline and/or poor judgment (pick any installation linked hazardous material incident).
- Loss of needed resources due to issues rising from internal team conflict – a stakeholder has the means to provide support, but choose not do so because of real or perceived slights or mistreatment or conflicting regulatory guidance.

The implications of these possibilities should be obvious whether the organization is public, private, business oriented or military. With respect to the Army, or any military organization, failure to execute missions in a timely/decisive manner, in accordance with established goals can result in loss of life, and compromise of objectives on a large scale. In the case of sustainable development, such failure compromises the ability of future generations to meet their needs.

In order to move forward to implement a strategic vision and establish an embedded culture, it is imperative for the strategic leader to align the organization with the mission by conducting broad spectrum scanning to determine mission focus and long term requirements. An examination of organizational demographics is advisable to assess what cultural issues may exist, which ones are readily observable (Artifacts) and strive hard to find and address those issues (underlying assumptions) lurking at the bottom of Schein's Organizational Model that shape and affect the organizational Norms and Values.¹²

Continuing along the path to establishing the organizational culture and executing the strategic plan, once targets for change have been identified, the strategic leader must provide a clear vision to form the basis to shape the organizational culture, establish metrics and build necessary internal and external relationships to institutionalize awareness. To ensure maximum clarity, the vision must be effectively and efficiently communicated, horizontally, vertically, internally and externally throughout the organization and its partners' [organizations].¹³ John Kotter lists the use of multiple forums and repetition as two of the keys to communicating vision and goals throughout an organization to ensure they are understood and become integrated into the daily work environment.¹⁴ When this is done, the culture related foundation is now identified, has the weight of the leader's priority and can be linked to organizational lines of effort and decision making processes.

Shaping the organizational culture through continuous linkage to the vision may be accomplished by effective communication inside and outside the organization, but must be supported by related relevant training of the stakeholders. In the current

operating environment external organizations provide representatives across nations, agencies and services, hence the use of the term “stakeholders” instead of “employees” because the cultural vision should be understood (and ideally – bought into) by contributing parties. With respect to sustainable development and sustainability, great opportunity exists for public/private partnerships to achieve stated goals (some examples follow later in this paper). Such buy-in creates a synergy that serves to create a sense of trust and tolerance, which therefore expedites decisions and consensus leading to better cooperation, better allocation of resources and mission accomplishment. All of this is predicated upon the continuous communication of the leader’s goals and objectives for the organization and the leader “walking the walk” himself.

Through the use of reinforcing and embedding actions¹⁵ to empower subordinates, visibly presenting awards and rewards to recognize excellence in performance meeting/exceeding the goals and objectives, plus swift and fair discipline for negative behaviors, the strategic leader has now established a healthy climate for the organization and a framework to re-assess cohesiveness, and address new or not-yet-mitigated issues. The leader must then sustain it by personally repeating and enforcing the goals, and assessing performance in a visible manner, always – leading by example.

Operationalizing Sustainability

Army Field Manual 6-0 defines Mission Command as “The exercise of authority and direction by the commander using mission orders to enable disciplined initiative within the commander's intent to empower agile and adaptive leaders in the conduct of full spectrum operations. It is commander-led and blends the art of command and the

science of control to integrate the warfighting functions to accomplish the mission.”¹⁶

The fundamental principles¹⁷ of mission command consist of:

- Cohesive teams built from mutual trust
- Shared understanding
- Clear communication of intent
- Exercise of disciplined initiative
- Use of mission orders
- Acceptance of prudent risk.

How may the principles of Mission Command be applied to a strategy of sustainability? In order for the political objective (End) of a sustainable operating environment to be realized, the military (Means) contribution must be defined and undertaken by instilling a work ethic/culture of consideration and ultimately direct action in the form of formidable, yet flexible standards (Ways) of daily business and life practices. Sustainability is a political objective? Indeed it is. Sustaining the resources of the nation is imperative in order to continue to project all instruments of national power: Diplomacy, Information, Military and Economic. As stated at the beginning of this section - Sustainability is a matter of National Security.

Army Sustainability

It has been twenty years since the Army published an updated comprehensive strategy for the environment. The *U.S. Army Environmental Strategy Into the 21st Century of 1992*¹⁸ established a vision of the Army being “a national leader in environmental and natural resource stewardship for present and future generations as an integral part of our mission,” and provided five primary directions:

- Give immediate priority to sustained compliance with all environmental laws.
- Simultaneously continue to restore previously contaminated sites as quickly as funds permit.
- Focus efforts on pollution prevention to reduce or eliminate pollution at the source.
- Conserve and preserve natural and cultural resources so they will be available for present and future generations.

The strategy was based upon a foundation of Shared Values, People, Resources, Communication, Management and Organization and Leadership. The pillars of **Compliance, Restoration, Prevention** and **Conservation** upheld Environmental Stewardship, and capping the structure was the Army Mission. It established goals and objectives, a communication plan, feedback, evaluation and reward programs. An accounting was also provided illustrating the strides already taken in support of the five pillars. It appeared that with respect to the path projected by the Bruntland Report, the Army was “rolling along.” The Army was also showing foresight in that this guidance was aligned with principles of sustainability published later, or perhaps the Army guidance was ahead of its time, providing basis for further thought and subsequent publication (in 2003), by Bob Doppelt that outlines five processes to integral to sustainability in business and government:

The Five “Rs” of Sustainability¹⁹

- **Redesign** products, processes, services, and physical spaces (buildings, infrastructure) to conform to principles of a borrow-return (eco-efficiency) approach.

- **Replace** environmentally harmful materials, substances, and energy sources with those that are safe for the environment and people.
- **Reduce** the amount of those feedstocks (resources, raw materials) that are used and consumed.
- **Refine** production processes and delivery systems to increase efficiency (water and energy usage).
- **Recirculate** by-products and materials once considered waste into new processes or products or back into nature without harm to the environment or humans.

The Army did not rest upon the 1992 goals until now. In fact, the Army has been a leader in environmental and sustainability efforts. However, efforts early on were not typically holistic and were often stove-piped into environmental offices or other specific focus areas such as Training Support. The Army-wide adoption of the Integrated Training Area Management (ITAM) program in 1988, for example, made significant changes in the way United States Army Europe (USAREUR) prioritized funding for ranges and training area projects and succeeded in turning Hohenfels Training Area from a muddy mess into the world class Combat Maneuver Training Center it is today and benefitted local training area development across the USAREUR area of responsibility.^{20, 21} A chronology of Army sustainability presented in the *Journal of Installation Management* (Spring 2011) credits US Army Forces Command (FORSCOM) with establishing the FORSCOM Installation Sustainability Program (ISP) in 2000. This process was in response to directives from the Army Vice Chief of Staff mandate to develop “an integrated strategy, with a defined endstate, that ties resources

to objectives and engages stakeholders at all levels to sustain the mission.” Fort Hood, Fort Lewis, Fort Carson and Fort Bragg were the first to implement the ISP in 2001 and contributed to its refinement through 2003, ultimately developing a systems thinking approach based upon the components of **A**wareness, **B**aseline, **C**lear (Vision/Mission/Goals), **D**own to action, **E**valuation, **F**eedback (continuous improvement) and **G**et better, or A-B-C-D-E-F-G Model.²² Another significant milestone was the 2004 publishing of *The Army Strategy for the Environment: Sustain the Mission – Secure the Future*,²³ which has served as the foundation for Army sustainability programs. It introduced the concept of mission, environment and community—plus the economic benefit— and established six goals that influenced Army decisions in the years that followed:

- Foster an ethic within the Army that takes us beyond environmental compliance and to sustainability.
- Strengthen Army operational capability by reducing our environmental footprint through more sustainable practices.
- Meet current and future training, testing and other mission requirements by sustaining land, air and water resources.
- Minimize impacts and total ownership costs of Army systems, materiel, facilities and operations by integrating the principles and practices of sustainability.
- Enhance the well-being of our Soldiers, Civilians, Families, neighbors and communities through leadership in sustainability.
- Use innovative technology and the principles of sustainability to meet user needs and anticipate future Army challenges.²⁴

The formation of the Installation Management Agency (now Installation Management Command – IMCOM) in 2004 resulted in the transfer of oversight for sustainability planning from FORSCOM, with assistance from Office of Assistant Chief of Staff for Installation Management (OACSIM) in 2006-2007. Despite transition of sustainability oversight to U.S. Army Environmental Command (USAEC) in 2006, installations remained decisively engaged in integrated long term planning.²⁵ When executing Base Realignment and Closure (BRAC) activities, for example at Fort Lee, Virginia, extensive efforts were employed by integrated planning and synchronization staffs which were made up of stakeholders and functional subject-matter-experts, to ensure enduring sustainable technologies and processes were embedded in all facets of design and construction.²⁶

The Army published the Army Energy Security Implementation Strategy (AESIS) in 2009 in which comments from GEN Peter W. Chiarelli, then Vice Chief of Staff and co-chair of the Senior Energy Council, solidified the Army's commitment. The culture of sustainability with respect to energy awareness continues to evolve – "...AESIS, approved on 13 January, 2009 by the Senior Energy Council, establishes five strategic security goals and outlines a broad approach for accomplishing them. The strategy also focuses upon creating a culture of energy awareness throughout the Army."²⁷ The five strategic security goals (ESG) are:

- ESG 1. Reduced energy consumption
- ESG 2. Increased energy efficiency across platforms and facilities
- ESG 3. Increased renewable/alternative energy
- ESG 4. Assured access to sufficient energy supplies

- ESG 5. Reduced adverse impacts on the environment

The AESIS also considers energy security through an enterprise lens and as such recognizes the roles and responsibilities of all organizations must be coordinated and integrated in order to fully align people, processes and technology in an efficient manner to achieve success horizontally and vertically throughout the Army. The AESIS establishes the Army Energy Security Vision in terms of Leadership, Partnership and Ownership in which centralized and decentralized leadership will be keys supporting expeditionary mobility; research and development efforts; training Soldiers and Civilians, and improving infrastructure. It also recognizes the role of Leadership in the ongoing culture changes required to lend priority to energy efficient usage and the need for accountability and incentives. The AESIS looks to Partnership in order to promote the leverage provided by technological collaboration between private industry and the Army to fully capitalize upon mutually profitable efficiencies in order to realize long term savings. A second order effect in this area is that access to installations by industry partners will be a key factor in this endeavor and must be thoroughly explored to strike the proper balance of risk and installation security. The AESIS cites Ownership as the foundation of the vision where accountability, education and awareness must be instilled in Soldiers and Civilians from the beginning of their Army careers.²⁸

The Army Energy Security Mission: “Make energy a consideration in all Army activities in an effort to reduce demand, increase efficiency, seek alternative sources, and create a culture of accountability, while sustaining or enhancing operational capabilities,”²⁹ recognizes the part that energy plays in sustaining warfighting

capabilities and our quality of life. Below is a further illustration of the five ESGs established in the AESIS³⁰:

- ESG 1. Reduced Energy Consumption

Reduce the amounts of power and fuel consumed by the Army at home and in theatre. This goal will assist in minimizing the logistical fuel tail in tactical situations by improving fuel inventory management and focusing installation consumption on critical functions.

- ESG 2. Increased Energy Efficiency Across Platforms and Facilities

Raise the energy efficiency for generation, distribution, storage and end-use of electricity and fuel for system platforms, facilities, units and individual Soldiers and Civilians. This goal also relates to the productivity of a system based on energy requirements and supports the ability to make informed trade-offs in development, engineering and deployment of weapon systems.

- ESG 3. Increased Use of Renewable/Alternative Energy

Raise the share of renewable/alternative resources for power and fuel use, which can provide a decreased dependence upon conventional fuel sources. This goal also supports national goals related to renewable/alternative energy.

- ESG 4. Assured Access to Sufficient Energy Supply

Improve and maintain the Army's access to sufficient power and fuel supplies when and where needed. Energy is a critical resource in conducting Army missions. Vulnerabilities to external disruption of power and fuel sources should be minimized and the potential for industry partnerships to enhance energy security and generate net revenues for the Army should be considered.

- ESG 5. Reduced Adverse Impacts on the Environment

Reduce harmful emissions and discharges from energy and fuel use. Conduct energy security activities in a manner consistent with Army environmental and sustainability policies.

The principles of strategy implementation referenced earlier are adhered to in the AESIS establishment of the goals and vision, and also in the setting of enabling factors such as measurable goals and metrics. The AESIS also looks to establish an “extended

energy savings account to hold savings in the form of unobligated funding balances until they may be expended on certain designated projects... 50% of these funds shall be used at the installation that realized the savings for Morale Welfare and Recreation, Family Housing or quality of life activities..."³¹ Given the future budget reductions being considered over next ten years, it remains to be seen if this sort of incentive will survive.

When published in 2009, AESIS³² listed some of the activities in place and since then additional installations have begun to follow suit:

- Development of Energy and Environmental Plans
- Army Energy & Water Campaign Plan for Installations, 2007
- Army Energy Strategy for Installations, 2005
- The Army Strategy for the Environment, 2004
- The AR 5-5 Future Tactical Fuel and Energy Strategy Study, (completed in 2010, awaiting approval)
- Energy programs or organizations for reduction of energy use, efficiency gains and accountability
- Army Metering Program
- Chartering of the Army Mobility Fuels & Energy Council (AMFEC)
- Energy Engineering and Analysis Program (EEAP)
- The Natural Gas Risk Management Program
- Army construction that incorporates Leadership in Energy and Environmental Design® (LEED) green building rating system
- Ongoing technology development
- Smart power grids; micro-grids
- Electric/hybrid vehicles
- AMC-led Fuels Management Defense (FMD) Initiative

- Energy Conservation Investment Program (ECIP)
- High efficiency lighting project at Fort Lee, VA
- Phase two barracks geothermal conversion at Fort Knox, KY
- Industrial energy optimization at Rock Island Arsenal, IL
- Army Energy Initiative Projects
- Solar energy generation at Ft. Irwin, CA
- Private industry installation energy management, Ft. Leavenworth, KS
- Neighborhood electric vehicles (NEVs) at multiple Army installations
- Geothermal power, Hawthorne Army Depot, NV
- Biomass-to-liquid fuel technology demonstration at six Army installations

In July 2008, then Secretary of Defense Robert M. Gates commented on the pressure likely to be faced in the next twenty years "...certain pressures – population, resource, energy, climate, economic, and environmental – could combine with rapid cultural, social, and technological change to produce new sources of deprivation, rage and instability."³³ This commentary indicates sustainment of future resources could be a valid mitigation of the cause of future conflicts as opposed to treatment of the symptoms. This being the case, the preservation of resources now therefore alleviating (or even eliminating), problems for following generations to manage should be obvious and imperative. With respect to national security, that means – less expenditure of blood and treasure of our sons and daughters following in our footsteps in the profession of arms.

The 2009 Army Posture Statement followed Secretary Gates' lead and provided a description of the operating environment as filled with globalized, fast information flow, equally fast emerging technology, a plethora of weapons of mass destruction alongside

natural disasters.³⁴ The current Army Campaign Plan reiterates this description and further The *Army Sustainability Campaign Plan (ASCP)* published in May, 2010, also follows suit and established the following tenets for sustainability³⁵:

- Developing, producing, fielding, and sustaining materiel that is more energy efficient, is capable of using renewable energy resources, minimizes the use of hazardous materials, and generates less waste.
- Increase cross-functional awareness of programs to leverage successful initiatives and maximize efficiencies.
- Develop processes that recognize where our “up-front” investments in more efficient designs will result in lower total life-cycle costs.
- Develop programs where Soldiers, Civilians and Family members have a personal commitment to sustainability and are active participants in programs that enhance readiness and extend our operational capabilities.
- Allow Commands to develop supporting goals and objectives, along with metrics to measure performance and drive resource decisions.

The tenets above reflect the maturation of the Army’s commitment to continuous improvement of sustainable development concepts, moving away from compliance oriented guidance toward a much more innovation-centric posture. This evolution is significant if we consider Bob Doppelt’s principles discussed earlier, in which organizations often fail at sustainability when they are anchored to models that support only marginal efficiencies or regulatory compliance. With this in mind, the move toward innovation is a positive step. As stated earlier in Dr. Odom’s article, “twenty-eight IMCOM installations worldwide have made a deliberate effort to plan through a

sustainability lens as a formal course of action, while many other have implemented projects to take up the challenge to operationalize sustainability principles.”³⁶

What is the Army Doing Now? – The Macro Scale

What sort of major muscle movements are currently on the Army playlist? As a follow on to the AESIS, the Army G-4 commissioned a study to develop a Tactical Fuel and Energy Implementation Plan in 2010 to add specificity to AESIS’ broad energy security goals. In the Spring of 2011, Katherine Hammack, Assistant Secretary of the Army for Installations, Energy and Environment, listed three specific goals for the Army with respect to sustainability that fall within the Army’s energy and sustainability visions in the AESIS and the ASCP³⁷:

- Net Zero
- Leveraging Opportunities for Private Sector Investment
- Base Camp Operational Energy

Net Zero

The Army is piloting six installations to be Net Zero Energy, six installations to be Net Zero Waste, six installations to be Net Zero Water, and two installations to be all three by 2020. The Army goal is to have 25 Net Zero Installations by 2030.³⁸ The Army’s goal is to manage our resources in a sustainable manner. Net Zero is a holistic approach to addressing energy, water, and waste. The Net Zero approach is comprised of five interrelated steps: reduction, re-purpose, recycling and composting, energy recovery, and disposal. Reduction includes maximizing facility energy efficiency, implementing water conservation practices, and eliminating unnecessary waste generation. Re-purpose involves diverting energy, water or waste to a secondary purpose with limited processes. Recycling or composting involves management of the solid waste stream, development of closed loop water system, or energy cogeneration. Energy recovery occurs by converting unusable solid waste or thermal energy from a waste water stream to energy. Disposal is the final step after the last drop of water, the last bit of thermal energy and all other waste mitigation strategies have been fully exercised.³⁹

The Net Zero Hierarchy⁴⁰ shown in Figure 1 has great similarity to Doppelt's Five Rs of Sustainability seen earlier.

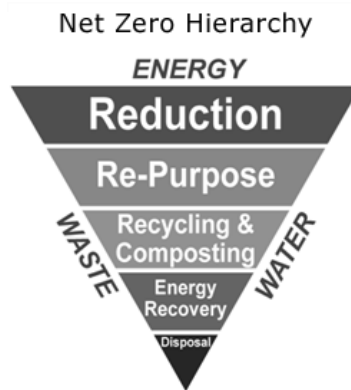


Figure 1: Net Zero Hierarchy

Leveraging Opportunities for Private Sector Investment

The *Leveraging Opportunities For Private Sector Investment* goal represents the Army's interest in working closely with the private sector to increase investment through four authorized sources of financing: Energy Savings Performance Contracts (EPSC), Utility Energy Savings Contracts (USC), Enhanced Use Leasing (EUL), and Power Purchase Agreements (PPA). These vehicles provide Army installations with, in some cases, long term (10-25 year) savings opportunities while keeping up front costs down.

Energy Savings Performance Contracts (EPSC) give Army facility managers a solution to facility problems with minimal up-front cost. Applied with care and consideration, ESPCs can help facility managers:

- reduce equipment breakdowns and emergency repair requests,
- provide better, more productive living and working conditions for people,
- reduce costs,
- meet environmental mandates,
- save energy and meet management goals.⁴¹

In the case of *Utility Energy Savings Contracts (UESC)*,

UESCs are similar to ESPC's. The most notable difference is that the projects are financed and implemented through utility companies. The utility provides comprehensive assessment of cost effective energy efficiency, renewable energy or water efficiency opportunities to the Army for our evaluation. The utility also provides the capital costs of the assessment, design, construction, performance testing, and other optional services like Operation and Maintenance (O&M), Commissioning, and Measurement and verification (M&V). The Army agrees to pay for the costs of services and equipment replacement from generated savings.⁴²

Enhanced Use Leasing (EUL) allows the Army to lease underutilized real property.

The EUL Program engages through a competitive process, private sector entities to acquire and leverage value from underutilized non-excess real estate assets on Army Installations. Mirroring a private sector transaction, the EUL's value proposition is competitive on cost and speed of execution. The law requires the lessee to pay in kind consideration in an amount that is not less than the fair market value of the lease interest. However, the categories of in-kind consideration that may be accepted include construction of new facilities, restoration (including environmental), acquisition, alteration and other services.⁴³

Power Purchase Agreements (PPA) are more complex to establish and have good value, especially when considering solar power innovations which traditionally high front end costs many see as a major impediment.

PPAs cover up-front equipment and installation costs for renewable energy systems while the customer pays only a monthly amount. PPAs involve a third party who pays for and owns the system. With a PPA, the installation purchases the kilowatt hours used monthly at a pre-set rate that may or may not incrementally increase over the term of the agreement. PPAs make operational power costs predictable. The advantage to investors is that they have the long-term security of a system that will produce revenue from electricity generated for more than 20 years, while the Army gets affordable electricity, typically below the retail electricity rate, for the life of the contract. Among the barriers to PPAs is that they are relatively complex, incorporating legal obligations, procedures and technical requirements that are well beyond the ability of the average facility manager to understand, requiring a consulting engineer and legal counsel. An alternative is hiring a solar integrator, a company that can handle financing details and system installation from design to commissioning. PPAs also mean that the developer can receive tax deductions, cash incentives, utility rebates and, some, but not all of the renewable energy credits. PPAs have their pluses and minuses, but when money is not available for a capital investment in solar power, they can turn visions of cleaner power into reality.⁴⁴

Base Camp Operational Energy

According to the Defense Science Board, 34% of fuel consumed in the wartime operating environment is used to produce power within forward operating areas.⁴⁵ Reducing operational demands for electricity is one way to reduce the amount of fuel consumed. It is important understand that fuel costs are not just dollars per gallon: “Fuel and water make up 70-80 percent of our resupply weight into the combat zone and there is one casualty for every 24 convoys. So our efforts on contingency bases will not only save money but will save lives.”⁴⁶

As referenced in Army Posture Statement excerpts, just as the full life cycle fuel costs are being reviewed during procurement, so is the Fully Burdened Cost of Fuel. These are being examined in support of the effort to reduce dependency upon fossil fuels and other logistical needs of forward base camps in order reduce the second and third order costs of putting convoys on the roads, in harm’s way, to effect resupply. An additional cost is the force protection requirement for the resupply convoys. They are lucrative targets having greater impact than simply the supplies being delivered. Therefore, sustainability is a means to reduce the expenditure of blood and treasure. By implementing the emerging technology, we can reduce the total fuel requirement to power operating bases.

The Army has taken a significant step by incorporating all fuel costs throughout the lifecycle of the equipment as we analyze various alternatives for modernization programs to ensure the proper equipment is procured to provide the correct amount of power. This approach enables us to make informed decisions about various alternatives and define energy efficiency performance parameters in capability documents for our program managers and original equipment manufacturers. Of course, not all solutions

will involve big pieces of equipment or new vehicles. We are also pursuing technologies on a smaller scale, such as spray foam tent insulation and shower water recycle systems — investments from which direct energy savings pay off in a matter of months. A generator can be replaced with batteries or solar energy alternatives. These however may or may not provide the entire energy requirement. An innovation being explored would be a generator, at least partially powered by photovoltaic means which recharges the batteries. A reduction in fuel requirements of up to seventy percent may be realized as the generator runs only when the batteries are in need of recharging: Rechargeable batteries, recharged by a generator using a renewable fuel source, using efficient energy management software to regulate the generator operation to minimum required times. Some other near and long term examples for use in Base Camp operations are:⁴⁷

- Command Post Central Power System – power distribution system that reduces number of generators required to meet requirements (FY16).
- Improved Environmental Control Unit (IECU) – realizes 25% more efficient than current ECUs (FY22).
- Hybrid Intelligent Power (HI-Power) – intelligent micro grid system currently being developed that potentially reduces command post fuel needs by 25% (FY24).
- Advanced Medium Mobile Power Source (AMMPS) – 20% more efficient than current Tactical Quiet Generators (TQG) (FY28).
- Solar applications like flexible panels for small power requirements; larger panels resembling Solar Tents and trailer mounted arrays.

Vehicle/Aircraft Energy Efficiency Initiatives

The DSB study referenced above also cites 29% of wartime fuel is consumed by combat aircraft. Aircraft initiatives are centered upon engine and transmission upgrades to reduce fuel consumption and increase horsepower to weight ratios.⁴⁸

- Replacement engines for Blackhawks and Apaches with potential for 25% better consumption over current models (FY25).
- Chinook engine replacements for 35% better efficiency (FY26).
- Blackhawk and Apache transmission replacements for 40% better horsepower to weight ratio (FY24).
- Chinook transmission replacement for 55% increase in horsepower to weight ratio (FY28).

Vehicle consumption is at 32% (combat vehicles -15%; tactical vehicles – 17%) of wartime fuel. In this area, perhaps more than others, is where great care must be taken to ensure efficiency efforts do not impede imperatives of operational effectiveness, Soldier safety, survivability, range, power, maneuverability, endurance and combat effectiveness. The intent is to improve fuel efficiency in legacy systems while fielding new systems in accordance with following goals and timelines⁴⁹:

- Joint Light Tactical Vehicle (JLTV) with 60 ton-miles per gallon (FY20).
- Ground Combat Vehicle (GCV) having 10% moving fuel consumption improvement over Bradley Fighting Vehicle (BFV) (FY22).
- Fielding a Medium Tactical Vehicle family (FMTV) that is 15% more efficient (FY25).

- Heavy Expanded Mobility Tactical Truck (HEMTT) with at least 15 more efficiency (FY25).
- Improvement of Abrams tank combat operational endurance from one day to two days using on-board fuel which reduces up to five HEMTT requirements per Heavy Brigade Combat Team (HBCT).^{50, 51}

Operational Energy

The Army embarked upon an Operational Energy Strategy with much of the groundwork being performed by the Combined Arms Support Command (CASCOM) and the Sustainment Center of Excellence at Fort Lee. Part of the strategy is the budding Army Operational Energy Campaign Plan (AOECP). The Five Rs of sustainability may be linked to the basic foundations depicted below: Refinement of policy and processes to promote efficiency in procurement and performance; Reduction in demand for energy/fuels through technology and process adjustments; Recirculation of resources through conservation and application of technology that allows for alternative and/or less hazardous materials used in manufacturing; Replacing ineffective policies and establishing education/information programs to ensure full participation of Soldiers, Civilians and Family Members to fullest extent in sustainable endeavors. To that end, the intent is to provide more options and less risk; increased capability at reduced cost, and ultimately resulting in more fight using less fuel.

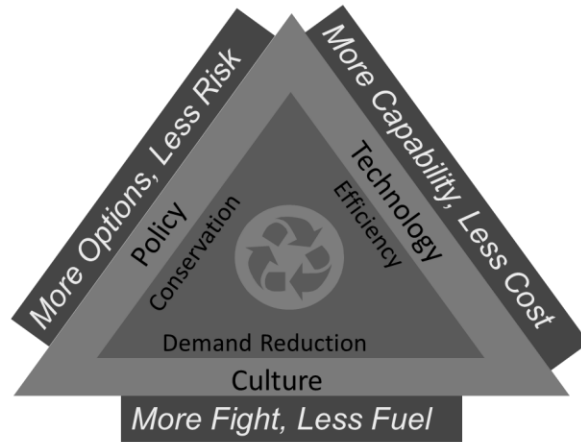


Figure 2: CASCOM Operational Energy Graphic

CASCOM is pursuing the strategy in a three pronged approach, as seen graphically in Figure 2, above. At a recent Energy Alternatives for Defense Summit, comments by William Moore, the Deputy to the Commanding General of the Combined Arms Support Command and Sustainment Center of Excellence galvanized the essence of how the Army must institutionalize sustainability of energy: “Initially, implementation policies, plans and processes need to be in place to guide our efforts to ensure that energy is a consideration in everything we do. We need to embrace advances from all technological areas that support our goals to increase efficiency and effectiveness of the energy we consume. Technology will also likely reveal alternatives to current methods to supplying, storing and distributing energy. Ultimately, a shift in culture is required to change how we see operational energy. To that end - instilling an ethos that values energy and considers efficiency to be critical to combat effectiveness requires behavior change at all levels. The magnitude of this change requires strong and consistent leadership and educating leadership spans the full range of instruction at the formal schools from entry level to career and command level courses.”⁵²

Recommendations

Leadership and consistent strategic communication are essential to providing the context of why sustainability is important. Leaders must inspire innovation to promote and ensure sustainable habits become daily considerations in all aspects of the Operational and Institutional Army. The clear metrics described in the Tactical Fuel and Energy Plan as follow on the AESIS should be implemented as we can no longer kick the can down the road. Care must be taken to not allow fiscal uncertainty to undermine the efforts of local commanders' innovation and initiative; senior leaders must encourage and reward achievements at all levels from enterprise-wide to individual garrisons/deployed bases. Continued close examination of right sizing power requirements from the individual Soldier load to future combat systems acquisition is imperative and requires critical thought into the management of expectations of each. We must institutionalize sustainable concepts into the education systems of our Soldiers, Non-commissioned Officers, Officers and DA Civilians from Initial Entry through Senior Level courses and instill the practices into daily life.

Conclusion

With respect to the questions posed in opening of this paper, the author believes the Army has taken great strides in efforts to provide a positive answer to each. The sustainability evolution (perhaps revolution better describes it), is not without internal and external obstacles and there is no single solution to overcome them. While the Army strategic message is getting out, the universal buy-in is still ongoing. Funding is a consideration and inculcation into the daily work/life ethic of individuals is a continuing effort. Each subsequent strategy and plan continues to cite a need for culture change, which indicates to the author the changes have not been fully adopted. Budget

reductions must be factored into the ability of organizations to implement sustainable innovations. Sustainable technology is expensive at the front end and the payoff is often slow in materializing. This is where champions of sustainability must not allow the concept to become just another buzzword or program-of-the-year. We must continue to push for innovation at all levels and reward accomplishments. We must not be averse to accepting prudent risk.

This problem may be resolved using the concepts of mission command through the application of sound strategies and innovations described here. There must be focus on long-term, achievable resolutions not just quick-return savings. This is not to say that short term gains realized as part of extended campaigns are not without merit, nor that pauses should not be accepted when perceived as being of reasonable duration. Leadership will be the key element in ensuring the institutionalization of a sustainable ethos becomes entrenched as an integral part of Army culture.

In the words of former Chief of Staff of the Army Gordon R. Sullivan, “Less is not better, more is not better...better is better.”⁵³

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